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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/594,253	09/25/2006	Shinji Inagaki	296761US0PCT	7399

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EXAMINER	
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ART UNIT	PAPER NUMBER
1786	

NOTIFICATION DATE	DELIVERY MODE
06/30/2011	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/594,253	INAGAKI ET AL.	
	Examiner	**Art Unit**	
	ANDREW K. BOHATY	1786	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 27 May 2011.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-5,10,11 and 15-26 is/are pending in the application.

4a) Of the above claim(s) 15,19 and 20 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-5,10,11,16-18 and 21-26 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. This Office action is in response to the amendment filed May 27, 2011, which amends claim 1 and adds claims 21-26. Claims 1-5, 10, 11, and 15-26 are pending, where claims 15, 19, and 20 are withdrawn from consideration.

Response to Amendment

2. Applicant's amendment of the claims, filed May 27, 2011, has caused the withdrawal of the rejection of claims 1-5 and 11 under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) in view of Matthews et al. (Chem. Mater. 1993, 5, 1697-1700) as set forth in the Office action mailed March 2, 2011.

3. Applicant's amendment of the claims, filed May 27, 2011, has caused the withdrawal of the rejection of claims 16 and 18 under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) in view of Matthews et al. (Chem. Mater. 1993, 5, 1697-1700), Mashita et al. (JP 2000-306669), and Corriu et al. (Chem. Commun. 1996, 1845-1846) as set forth in the Office action mailed March 2, 2011.

4. Applicant's amendment of the claims, filed May 27, 2011, has caused the withdrawal of the rejection of claim 17 under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) in view of Matthews et al. (Chem. Mater. 1993, 5, 1697-1700), and Ogawa (J. Am. Chem. Soc. 1994, 116, 7941-7942) as set forth in the Office action mailed March 2, 2011.

Response to Arguments

5. Applicant's arguments filed May 27, 2011 have been fully considered but they are not persuasive.

6. In response to the applicant's arguments, on pages 8 and 9, that one would not add a secondary luminous material to the sol-gel material of Shea 1989 because Bartl only teaches the addition of a second luminous material to sol-gels made from TEOS, although Bartl only teaches the addition of the luminous material to TEOS sol-gels it is well known in the art TEOS is one of the most common reagents used to make sol-gels; therefore, one of ordinary skill in the art would use of the method of adding the luminous material to the sol-gel to other sol-gel materials. Also, Bartl does not limit the type of sol-gel that this can be applied to.

7. Also, although the structure of the monomers used to made the sol-gel are different and lead to a different sol-gel structures, the teachings of Bartl teaches how the optical properties of the sol-gel material can be altered by adding the luminous material; therefore, one of ordinary skill in the art would add the luminous material to the sol-gel of Shea 1989. The motivation would have been to change the optical properties of the material. The addition of luminous material to sol-gel materials is well known in the art; therefore, it would have been obvious to one of ordinary skill in the art to add luminous materials to the sol-gel material taught by Shea 1989.

8. In addition Bartl teaches why one of ordinary skill in the art would add the surfactant to the sol-gel mixture, so a mesoporous material would be made. Bartl

teaches that adding the surfactant leads an optical material that emits light that is more pure that light emitted from sol-gels that do not have the mesoporous structure (page 2475 left column last paragraph).

9. In response to the applicant's arguments on page10 that Bartl does not have an enabling disclosure on how the phosphorescent material in introduced into the pores, the applicant does not claim the phosphorescent material is found in the pores on the material, the applicant only claims the sol-gel comprises an additional luminous material. Also, Bartl teaches synthetic methods on how to make the sol-gel material comprising the luminous material; therefore, one of ordinary skill in the art would follow the method taught by Bartl to added the phosphorescent material to the sol-gel of Shea 1989 (see page 2474 left column last paragraph of Bartl). Given the teachings of Shea 1989 and Bartl, one of ordinary skill in the art would know on the incorporate the luminous material in the sol-gel material of Shea 1989 and also include a surfactant in the synthesis of the sol-gel.

Claim Rejections - 35 USC § 103

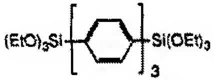
10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

12. Claims 1-5, 10, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) (hereafter "Shea 1989") in view of Bartl et al. (Chem. Commun. 2002, 2474-2475) (hereafter "Bartl").

13. Regarding claims 1-3, 10, and 11, Shea 1989 discloses a siloxane polymer made from the following monomer, , (573 left column, scheme in the middle of the page, paragraph 1, compounds 3a and 3z) which reads on formula (1) in claim 1, where X is benzene (an applicants' preferred fluorescent molecule that can be excited by light), R^1 is ethoxy (claim 2), n is 3 and m is 2 (claim 3). Shea 1989 does teach the use of the siloxane polymers in optics (page 574 left column paragraph 2).

14. Shea 1989 does not teach wherein the porous siloxane polymer comprises another luminescent compound, where that compound is phosphorescent and the compound is "adsorbed on", "bonded to", "filled in" or "mixed with" the polymer, and

wherein the siloxane polymer with the additional luminescent compound further comprises a surfactant.

15. Bartl teaches the encapsulation of rare earth material complexes in sol-gel derived composites (page 2474 left column paragraph 1). Bartl teaches the sol-gel derived composites include mesoporous silica and these materials are used for there optical properties (page 2472 left column paragraph 2). Bartl teaches the rare earth metals compounds to be Eu and Tb containing (page 2474 left column 2 paragraph), which are well known phosphorescent compounds (claim 11). Bartl teaches that when the phosphorescent rare earth metal complexes are mixed with the siloxane polymer and the polymer made further comprises a surfactant (P123) (claim 10) (page 2474 left column paragraph 3). Bartl teaches when a surfactant is present the size of the pores in the mesoporous structure is around 4 nm (page 2474 Fig. 1). Bartl further teaches that the light emitted from the mesoporous structure is more pure that light emitted from sol-gels that do not have the mesoporous structure (page 2475 left column last paragraph).

16. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the siloxane polymer of Shea 1989, so when the polymer was made the synthesis included a surfactant and a rare earth metal compound (phosphorescent material), so the resulting polymer contained an additional phosphorescent compound mixed with the polymer and the polymer further comprised a surfactant and the size of the pores is around 4 nm. The motivation would have been to make a siloxane polymer structure that emits light with a higher purity. Both Shea 1989

and Bartl teach the use of their sol-gels for use in optics, while Bartl teaches the incorporation of phosphorescent materials in to the sol-gel network and that mesoporous structure displays better light purity then other mesoporous structures.

17. Regarding claim 4, although Shea 1989 does not specifically disclose wherein the difference in energy between the ground state and any of a singles excited state and a triplet excited is 40 to 140 kcal/mol the siloxane polymer from above inherently has this property. Also, the above siloxane polymer/monomer is an example of the applicants which contain this property (applicant's Ph-Si). Furthermore, the claimed properties would naturally flow from combination of Shea 1989 and Bartl.

18. Regarding claim 5, Shea 1989 discloses the siloxane polymer (page 573 compound 3z) using the above monomer has a structure with a regular spaced array by introduction of the organic spacer (benzene molecule) (page 572, right column paragraph 2, Figure 2). Since the monomer is a benzene ring the period would be less than 5 nm, because benzene has a length smaller that 5 nm.

19. Claims 16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) (hereafter "Shea 1989") in view of Bartl et al. (Chem. Commun. 2002, 2474-2475) (hereafter "Bartl") as applied to claims 1-5, 10, and 11 above, and further in view of Mashita et al. (JP 2000-306669) (hereafter "Mashita"), where machine translation is used as English equivalent, and Corriu et al. (Chem. Commun. 1996, 1845-1846) (hereafter "Corriu").

20. Regarding claims 16 and 18, Shea 1989 in view of Bartl does not teach wherein the siloxane polymer further comprises an electric charge transporting material. Shea 1989 does not teach a film with a thickness be 1 μm or less.

21. Mashita teaches a sol-gel (siloxane polymer) comprising a luminescent material and an electron transporting material (paragraph [0067]). Mashita teaches the use of the sol-gel in electroluminescent devices (paragraph [0011]). Mashita teaches the thickness of the layer comprising the sol-gel layer is preferably 0.5 μm or less (paragraph [0037]), and shows in the examples the layer can be 110 nm (paragraph [0067]). Mashita teaches the mixed sol-gel proved an electroluminescence device that is very efficient and long lifetime (paragraph [0009]).

22. Corriu teaches the use of bridged siloxane polymers can be used in light emitting diodes (page 1845 left column first three paragraphs).

23. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the siloxane polymer of Shea 1989 in view of Bartl to include an electron transporting material in the polymer and use the material in an electroluminescent device, where the thickness of the film is 0.5 μm or less. Mashita teaches the use of sol-gel in electroluminescent devices, while Corriu teaches that bridged siloxane polymers could be used in light emitting devices and Shea 1989 teaches the use of bridged siloxane polymers comprising of that benzene molecule as the bridging component. The motivation would have been to produce a siloxane polymer that could be used in a light emitting device and be very efficient and have a long lifetime.

24. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) (hereafter "Shea 1989") in view of Bartl et al. (Chem. Commun. 2002, 2474-2475) (hereafter "Bartl") as applied to claims 1-5, 10, and 11 above, and further in view of Ogawa (J. Am. Chem. Soc. 1994, 116, 7941-7942) (hereafter "Ogawa").

25. Regarding claims 16 and 18, Shea 1989 in view of Bartl does not teach wherein the siloxane polymer is a layered material of stacked nanosheets, where each layer having a thickness of 10 nm or less. Shea 1989 does teach the use of the siloxane polymers in optics (page 574 left column paragraph 2).

26. Ogawa teaches the synthesis of siloxane polymers that are in a layered structure, where each layer has a thickness of 1 nm (page 7942 left column paragraph 2 Figure 3). Ogawa teaches films are highly transparent in the wavelengths of 220 to 2000 nm (page 7942 right column paragraph 3).

27. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the siloxane polymers of Shea 1989 in view of Bartl, so siloxane polymer was in a stacked structure of nanosheets, where the thickness of each layer was 1 nm. The motivation would have been to form a film that was highly transparent in the wavelengths of 220 to 2000 nm.

28. Claims 1-5, 10, 11, 21, 22, and 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Loy et al. (Chem. Rev. 1995, 95, 1431-1442) (hereafter "Loy")

in view of Dunn et al. (J. Mater. Chem. 1991, 1, 903-913) (hereafter "Dunn") and Bartl et al. (Chem. Commun. 2002, 2474-2475) (hereafter "Bartl").

29. Regarding claims 1-3, 10, 11, 21, 22, 24, and 26, Loy discloses a siloxane polymer made from the following monomer, 

, (1435 left column, Figure 11) which reads on formula (1) in claim 1, where X is benzene (an applicants' preferred fluorescent molecule that can be excited by light), R^1 is ethoxy (claim 2), n is 3 and m is 2 (claim 3). Loy discloses that siloxane polymer is porous and the mean pore diameter is 2 nm or smaller (573 right column, paragraph 1). Loy does teach the use of the siloxane polymers in optics (page 1441 left column paragraph after heading B. Optical Applications).

30. Loy does not teach wherein the porous siloxane polymer comprises another luminescent compound, where that compound is phosphorescent and the compound is "adsorbed on", "bonded to", "filled in" or "mixed with" the polymer, and wherein the siloxane polymer with the additional luminescent compound further comprises a surfactant.

31. Dunn teaches the doping of sol-gel material with different organic molecules (abstract). Dunn teaches doping sol-gel materials with different organic molecules, such as fluorescent and phosphorescent dopants, one can change the optical properties of the material (page 910 left column third full paragraph). Dunn teaches one can tune the color of the emission of the optical material (page 910 right column last

paragraph). Dunn teaches a variety of different dopants can be added to the material, such as Rhodamine 6G, and any known light emitting dopant can be added to material (page 910 paragraphs under heading Sol-Gel Lasers and page 911 Table 2). Dunn teaches the amount of the fluorescent dopant can range from about 2% to 40% and teaches Rhodamine 6G can be about 40% of the sol-gel material (page 910 paragraphs under heading Sol-Gel Lasers).

32. Bartl teaches sol-gel derived composites including mesoporous silica and these materials are used for there optical properties (page 2472 left column paragraph 2). Bartl teaches the mesoporous silica is made by adding a surfactant to the reaction comprising the sol-gel material and the light emitting dopant (claim 10) (page 2474 left column paragraph 3). Bartl teaches when a surfactant is present the size of the pores in the mesoporous structure is around 4 nm (page 2474 Fig. 1). Bartl further teaches that the light emitted from the mesoporous structure is more pure that light emitted from sol-gels that do not have the mesoporous structure (page 2475 left column last paragraph). Bartl also teaches that the energy emitted from one dopant can be used to excited the other dopant found in the sol and lead to the second compound emitting light at a different wavelength (page 2475 left column last paragraph).

33. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the siloxane polymer of Loy, so when the polymer was made the synthesis included a surfactant and an additional fluorescent or phosphorescent dopant, so the resulting polymer contained an additional fluorescent or phosphorescent compound, in the amount of around 40%, mixed with the polymer and

the polymer further comprised a surfactant and the size of the pores is around 4 nm. The motivation to add the additional fluorescent or phosphorescent material would have been to change the optical properties of the sol-gel material. The motivation to add the surfactant would have been to make a siloxane polymer structure that emits light with a higher purity.

34. Regarding claim 4, although Loy does not specifically disclose wherein the difference in energy between the ground state and any of a singles excited state and a triplet excited is 40 to 140 kcal/mol the siloxane polymer from above inherently has this property. Also, the above siloxane polymer/monomer is an example of the applicants which contain this property (applicant's Ph-Si). Furthermore, the claimed properties would naturally flow from combination of Loy, Dunn, and Bartl.

35. Regarding claim 5, Loy discloses the siloxane polymer (page 1435 Figure 11) using the above monomer has a structure with a regular spaced array by introduction of the organic spacer (benzene molecule). Since the monomer is a benzene ring the period would be less than 5 nm, because benzene has a length smaller that 5 nm.

36. Regarding claim 25, the limitation would naturally flow from the combination of Loy, Dunn, and Bartl. Furthermore, Bartl shows that is well known in the art that the emission energy from one light emitting material can be absorbed by another light emitting compound causing the second light emitting compound to emit light at a different wavelength than the wavelength absorbed (page 2475 left column last paragraph).

37. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Loy et al. (Chem. Rev. 1995, 95, 1431-1442) (hereafter "Loy") in view of Dunn et al. (J. Mater. Chem. 1991, 1, 903-913) (hereafter "Dunn") and Bartl et al. (Chem. Commun. 2002, 2474-2475) (hereafter "Bartl") as applied to claims 1-5, 10, 11, 21, 22, and 24-26 above, and further in view of Jones et al. (US 6,682,810) (hereafter "Jones").

38. Regarding claim 23, Loy in view of Dunn and Bartl does not teach where the added fluorescent material is an aluminum porphyrin complex. Dunn does teach that any fluorescent material can be added to sol-gel (page 910 paragraphs under heading Sol-Gel Lasers and page 911 Table 2).

39. Jones teaches fluorescent material (abstract). Jones teaches a variety of different fluorescent materials that can be used for optical materials and teaches aluminum porphyrin complexes as a type of fluorescent material (column 7 lines 59-67 and column 8 lines 1-37).

40. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use an aluminum porphyrin complex as the additional fluorescent material. The motivation would have been to modify the optical properties of the sol-gel material, so the material emitted red light and adding the aluminum porphyrin complex would do this.

Conclusion

41. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

42. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

43. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANDREW K. BOHATY whose telephone number is (571)270-1148. The examiner can normally be reached on Monday through Thursday 8:00 am to 5:30 pm EST and every other Friday from 8:00 am to 4:30 pm EST.

44. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer Chriss can be reached on (571)272-7783. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

45. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. K. B./
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